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An Investigation of Phonetic Symbolism Utilizing the Chomsky-Halle System of Distinctive Features.

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AN INVESTIGATION OF PHONETIC SYMBOLISM UTILIZING THE CHOMSKY-HALLE SYSTEM OF DISTINCTIVE FEATURES

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy

in

The Department of Speech

by

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ABSTRACT

The phenomenon of phonetic symbolism was investigated experimentally to determine whether there existed a systematic relationship between the perceived connotative meaning of individual English phonemes and the Chomsky-Halle distinctive features associated with each phoneme. A review of the literature revealed no prior study which had approached the question of phonetic symbolism in this manner.

Ninety-nine subjects from freshman-level speech courses who had had no phonetic training responded on nine semantic differential scales to 36 visually presented phonemes. Key words were used to identify the sounds.

Overall correlations for each semantic dimension were highly significant ($p < .0001$). Evaluation was seen to be more discrete than Potency and Activity as a measure of semantic affect. Intercorrelations among the semantic dimensions and the Chomsky-Halle features showed a similar pattern. Analyses of variance among features for each dimension also produced significant ($p < .0001$) F values, indicating that subjects responded differently to the various features.

Duncan's Multiple Range Test for each dimension isolated four Chomsky-Halle features of note: [+ tense] was most highly rated; [- anterior] received lowest ratings; and

[+ low] and [- tense] were consistently clustered near the lower end of the rankings.

It was noted that the four phonemes sharing the feature [+ tense] -- /i/, /eɪ/, /u/, and /oʊ/ -- also share the feature [- anterior]. The dichotomy of responses produced by those two features, when considered in view of the overlap of sounds sharing the features, indicated an unexpected interdependence and suggested areas of further research.

CHAPTER I

Introduction and Review of Literature

Statement of Problem

Use of the term "phonetic symbolism" implies a belief that there is an intrinsic correspondence between language sounds and meanings. Certain sounds are said to suggest certain meanings apart from their conventional meanings because of the ways in which the sounds are produced. To English speaking people, the vowel /ɩ/ in "bit" seems to be appropriate to describe something small, the vowel /æ/ in "vast," something large. Thus, the nonsense syllable "mal" sounds bigger than "mil." Further, the usual hypothesis about phonetic symbolism is that it is universal in scope, i.e., the same sound is associated with the same meaning even in historically unrelated languages.

The traditional rationale for universal phonetic symbolism holds that sounds used in language have physical properties -- intensity, timbre, pitch, duration, etc. -- and that objects in the world also have physical properties. Rubenstein and Aborn (1960) pointed out that there is a correlation between pitch of sounds and size of objects. According to this view, small objects emit high sounds, and large objects emit low sounds. Paget (1930) maintains that the Proto-Polynesian words for large and small, "oho" and "i-i," are appropriate because the mouth forms respectively large and small apertures in producing the vowels. Also, as Jespersen (1922) observed, there is a tendency to lengthen and strengthen single sounds under the influence of strong feeling or in order to intensify the effect of the spoken word; thus, in the phrase "extremely long," the vowel /ɔ/ may be lengthened.

The problem is to determine whether or not such relationships between sound and meaning exist. If they do, are the same relationships universal, or do they exist only in particular languages? And, to what extent is there a relation between sound and meaning? Is it a function of dimensions of meaning? Although the present study is confined to the English language, several works dealing with universal phonetic symbolism will be reviewed for methodological considerations, research approaches being similar in the two areas of inquiry.

Review of Literature

Observations by Jespersen and others support the existence of phonetic symbolism. Socrates, in Plato's (1892 ed.) "Cratylus," ventures that "when we want to express ourselves, either with the voice, or tongue, or mouth, the expression is simply the imitation of that which we want to express" (p. 253). Jespersen (1922) observed that "back vowels are used in English for symbolic expression for dislike, disgust, or scorn" (p. 167). Such observations may be considered only suggestive, since in giving examples of a close relation between sound and meaning, the observers may have considered only those words that fit their theory.

There have been two types of experimental tests of phonetic symbolism. The word-matching technique, first used by Tsuru and Fries (1933), is still the favorite method of investigating universal phonetic symbolism. Usually, lists of antonymic pairs in two different languages are used for test material; subjects who know only one or neither of the languages are asked to match corresponding members of the two pairs in the two languages. Positive results in such tests indicate a better than chance matching of certain words in one language with words of the same meaning in another language. The matching experiments have led to conclusions both for and against the hypothesis of universal phonetic symbolism.

The following points on the word-matching experiments may be examined for methodological considerations. First, if the experimenters know both languages, they may select test words that resemble each other from the two languages. Since only 27 phonemes on the average (Hocket, 1958) are used to make words in a language, the chance cannot be excluded that some words of similar meaning in different languages may resemble each other. This fact may explain the unusually high matching success found by Tsuru and Fries (1933) and by Maltzman , Morrisett, and Brooks (1956) for English-Japanese.

(Maltzman used the same word list as did Tsuru.) Even if the experimenters know only English, still they have to choose certain English words as test words. Different criteria for choosing the test words may give different degrees of matching success. Brackbill and Little (1957) used only familiar test words and obtained three positive and three negative results. Brown, Black, and Horowitz (1955) and Brown and Nuttall (1959) used familiar and "sensory" words (e.g., warm-cool, heavy-light) from English and obtained significantly better than chance matching in their language pairs. In both experiments they took additional trouble to make the two words in each pair of nearly equal length. Brown and Nuttall concluded that the "phonetic symbolism effect may be limited to pairs naming continua concerned with magnitude and its concomitants" (p. 444).

Second, there is a likelihood of selecting a foreign equivalent to English by some sort of association mechanism. There seldom exists one and only one foreign equivalent to an English test word. In the process of translating English test words, a translator could choose the foreign equivalent that more resembles the given English word. For example, in translating "old" into a Japanese equivalent, a translator may choose "oita" instead of "toshitotta." Tsuru's list, for example, used "oita" for "old." Other similar choices may occur whenever direct translation is used to generate the words to be matched.

Third, these experiments do not answer the fundamental question of phonetic symbolism -- namely, what sound has what meaning. Suppose the Japanese word "midori" and the English word "green" are matched correctly in pairs with Japanese "aka" and English "red." There are a few features that are common in the words of these pairs. "Midori" and "green" share two sounds, /r/ and /i/, and "aka" and "red" have the same visual length. The question may arise as to which, if any, of these common features is identified with "greenness" or "redness."

Sapir (1929) and Newman (1933) investigated phonetic symbolism using an analytical approach, the second type of experimental test. English speaking subjects judged nonsense syllables for their size or brightness in a paired-comparison test. These nonsense syllables differed only by a single vowel. Thus, Sapir's subjects compared for size "mal" with "mel," or "mel" with "mil," and so on. In their experiments, both Sapir and Newman pronounced the test words. Such a technique for presenting stimuli may introduce bias, however. According to Eberhardt (1940), if her deaf subjects were unaware of the meanings of "tap" and "pound," they spoke the two words with little difference in intonation. But after the meanings were learned, "tap" became lighter and softer, while "pound" took on a richer resonance.

In these experiments, there is no evidence that the same ordering of the middle vowels will apply if the environmental consonants, for example "m-l," are exchanged for other consonants such as "v-g." "Vig" might conceivably sound bigger than "vag," whereas "mil" was found to seem smaller than "mal."

In a series of analytical experiments, Bentley and Varon (1933) found evidence to refute the hypothesis that "sounds carry in their own right a symbolic reference" (p. 77). In their first experiment, the investigators included the sounds /ɩ/ and /æ/, which were reported by Sapir and Newman to have distinct size contrasts. However, there is no indication of systematic control over the combination of sounds used in manufacturing the nonsense syllables presented as stimuli. Thus, there is no guarantee that the subjects were indeed responding only to the sounds to which the experimenters expected them to respond. The criticism concerning the auditory method of presentation mentioned with regard to the studies by Sapir and Newman applies here as well. In addition, Bentley and Varon used only three subjects in their experiments, and the same three throughout the series, which greatly reduces the generality of their findings.

More recently, Dagiri (1958), Miron (1960, 1961), Taylor and Taylor (1962), and Folkins and Lenrow (1966) all used the analytic method to determine the connotations of individual phonemes. All the studies included the size attribute of meaningfulness; Taylor and Taylor included movement, warmth, and pleasantness; Miron, and Folkins and Lenrow, used 15 different attributes.* All studies except Dagiri's included English speakers, while Dagiri, Miron, and Taylor and Taylor used Japanese speakers with different degrees of English knowledge. Taylor and Taylor also used Tamil and Korean speakers. In the experiments cited, there have been 51 independent tests of the consistency on different conceptual scales of subjective phonetic symbolism across subjects. All have shown positive correlations across speakers of the same language, and only three conceptual scales have failed to give strong correlations.** This overwhelming support for the existence of phonetic symbolism suggests that it is a pervasive feature of language behavior. It is not restricted to particular attributes, nor to trained subjects, nor to speakers of certain languages.

Nonetheless, the validity of these findings is mitigated by two methodological problems: the presence of allophonic variation in studies employing acoustic stimulation, and the confounding effect of environmental consonants and vowels in studies using nonsense syllables. The effects of phonetic symbolism are nominally due to the sounds in words. However, as has often been pointed out,

---

*The earlier study by Sapir used size only; Newman, size and brightness.

**Miron, and Folkins and Lenrow, English speakers, "heavy-light" and "cold-hot;" Taylor and Taylor, Tamil speakers, "movement."

> ...the total number of possible sounds is greatly in excess of those actually in use. Indeed, an experienced phonetician should have no difficulty in inventing sounds that are unknown to objective investigation (Sapir, 1921, pp. 44-45).

Furthermore, the sounds that are heard are far fewer in number than the sounds that are produced:

> Under normal circumstances, in the decoding process, people do not distinguish a difference between allophones. . . . Consequently, the allophone is too small to be a unit in the encoding process, implying that the phoneme is [a suitable unit]" (Saporta, 1965, p. 62).

Not only do listeners fail to hear fairly large differences in spoken sounds, they also hear nonexistent differences between two identical sounds in different contexts (Broadbent and Ladefoged, 1960; Ladefoged and Broadbent, 1957). Failures of hearing of this and other sorts imply that the natural unit for analysis of phonetic symbolism is the phoneme. In a sense, it might be better to speak of "phonemic symbolism."

Despite the apparent validity of analyzing phonetic symbolism at the "phonemic level" (Heise, 1966), the stimuli for analytic studies have generally been real or nonsense words, consonant-vowel combinations, or CVC trigrams. Taylor and Taylor (1965) have commented on the questionable assumption that the symbolic properties of component phonemes are additive in such stimuli. Research in acoustic phonetics (formant transitions: Peterson and Barney, 1952; duration, fundamental frequency, and intensity: House and Fairbanks, 1953; as well as the above-mentioned studies by Ladefoged and Broadbent) and investigations of coarticulation (Oehman, 1966; Daniloff and Moll, 1968) provide a questionable empirical basis for maintaining this assumption. Although some related studies have used isolated visual or acoustic stimuli (alphabet letters: Knapp and Ehlinger, 1968; sonar signals: Solomon, 1959), only two studies (Folkins and Lenrow, 1966, and Shriberg, 1970) have presented single phonemes in a visual format.

Studies by Black (1968), Singh and Woods (1971), Singh, Woods, and Becker (1972), Singh and Becker (1972), and Winer and Singh (1974) have examined various distinctive feature systems with regard to their suitability in classifying phonemes and predicting perceptual differences and similarities among them.

Black (1968) established groupings of consonants according to twelve factors isolated by factor analysis. He found a tendency for the factors to relate to traditional adjectival categories (plosive, fricative, etc.) and to systems of distinctive features, notably the scheme outlined by Jakobson, Fant, and Halle (1952). Singh and Woods (1971) had subjects judge dissimilarity among vowel pairs. Their judgments were correlated with four features (advancement, height, retroflexion, and tenseness), which were ranked according to their relative perceptual importance. Winer and Singh (1974) also analyzed similarity judgments for pairs of English fricatives along four distinctive feature dimensions (voicing, sibilant, front/back, and palatal) and ranked their relative importance as well.

Singh, Woods, and Becker (1972) compared four different feature systems with regard to their ability to predict perceptual similarities among English consonants. The systems compared were those of Miller and Nicely (1955), Singh and Black (1966), Wickelgren (1965, 1966), and Chomsky and Halle (1968). They concluded that the Chomsky-Halle feature system "is the best of the four systems compared" (p. 1712). Further, "only the Chomsky-Halle system showed consistent ranking of features over the three data collection methods" (p. 1706) -- seven-point scaling, magnitude estimation, and triadic comparison. They also ranked the relative importance of the features. In a related study, Singh and Becker (1972) found that the Chomsky-Halle distinctive feature system attained its highest correlation with data collected by the seven-point scaling method and was the best of the four systems in fitting data from this source.

A search of the literature in phonetic symbolism has failed to disclose a single study in which a dependent measure of meaning has been correlated with the distinctive features characteristic of each phoneme under consideration. The present study undertakes such a correlation.

Statement of Hypotheses

Considering the fact that the present study is unique in applying the Chomsky-Halle distinctive feature system to a research project in phonetic symbolism, specific hypotheses based on prior findings could not be formulated. The purpose of the study was first to establish a data base consisting of semantic differential ratings for each of 36 English phonemes on the evaluative, potency, and activity dimensions of connotative meaning. From this base, applying the procedures discussed in Chapter II, the features of the Chomsky-Halle system were examined as predictors of subjects' perceptions of the connotative meaning of the phonemes under consideration.

The findings of Singh, *et al.*, in their distinctive feature analyses of the acoustic similarities of phonemes included ordering of the features' relative importance as predictors of similarity judgments. These studies suggested a comparison of findings for the purpose of determining the existence of a relationship between the acoustic similarity of phonemes and their perceived connotative meaning.

It was anticipated that such a comparison would reveal a congruence between the distinctive features responsible for perceived acoustic similarity and those related to perceived connotative meaning.

CHAPTER II

Methodology

Subjects and Procedure

Ninety-nine subjects, selected from introductory speech courses at Louisiana State University, acted as respondents to a semantic differential testing instrument. None of the subjects had prior training in phonetics. Their participation was voluntary, and the only information given concerning the purpose of the study was that provided in the following printed instructions:

> We are interested in how individual sounds are used in communication.
>
> The 36 basic sounds of the English language are presented on the following pages, each accompanied by two common words which contain the sound as it is usually pronounced. The purpose of these words is merely to aid you in identifying the sound, which is represented by its dictionary symbol. The sound is then underlined in each word. Printed below each sound are several descriptive scales.
>
> You are to pronounce each sound quietly (not the key words). Then indicate your description of the sound by placing an "X" on each scale in the space you feel best describes the sound. Here is an example:
>
> ȯ - always, bought
>
> Noisy :____: X :____:____:____:____:____: Quiet
>
> Etc. (There will be nine such scales.)
>
> Thus, if the vowel sound "ȯ" as in "bought" seems to you more noisy than quiet, you would place an "X" in one of the spaces closer to "Noisy," as in

> the example. The middle space on each scale is a neutral position. If "ȯ" seems neither "Noisy" nor "Quiet," or equally "Noisy" and "Quiet," you would place an "X" in that location. But *please do not fail to mark any scales, whether they appear relevant or not.* And be sure your marks are *between* the dots separating each space.
>
> Work quickly. It is your initial impression we are interested in. There are no "right" or "wrong" responses.
>
> Before you begin, ack any questions you may have. Thank you for your help in this project.

The average length of time required to complete the testing instrument was 45 minutes.

Selection of Testing Materials

The 36 sounds chosen for investigation consisted of the 31 English phonemes treated by Chomsky and Halle (1968) and five additional phonemes: the affricates /tʃ, dʒ/ and middle vowels /ə, ʌ/, and the velar nasal /ŋ/, whose distinctive feature characteristics could reliably be interpolated from the Chomsky-Halle classification. The diphthongs /aɪ, aʊ/ were omitted since their characteristics are ambiguous in the Chomsky-Halle scheme. Table 1 presents the classification of phonemes by the presence (+) or absence (-) of each pertinent distinctive feature.

Following the practice of Singh, Woods, and Becker (1972) and Ladefoged (1975), four of the 17 Chomsky-Halle features are omitted from the present classification, since they are either redundant or not applicable to English phonology. The omitted features are "distributed/nondistributed,"

Table 1

Classification of Phonemes by Distinctive Feature

Feature / IPA	p	b	t	d	k	g	f	v	θ	ð	s	z	ʃ	ʒ	t	d	m	n	ŋ	l	r	h
Vocalic	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	−
Consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−
High	−	−	−	−	+	+	−	−	−	−	−	−	+	+	+	+	−	−	+	−	−	−
Back	−	−	−	−	+	+	−	−	−	−	−	−	−	−	−	−	−	−	+	−	−	−
Low	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+
Anterior	+	+	+	+	−	−	+	+	+	+	+	+	−	−	−	−	+	+	−	+	−	−
Coronal	−	−	+	+	−	−	−	−	+	+	+	+	+	+	+	+	−	+	−	+	+	−
Round																						
Tense																						
Voiced	−	+	−	+	−	+	−	+	−	+	−	+	−	+	−	+	+	+	+	+	+	−
Continuant	−	−	−	−	−	−	+	+	+	+	+	+	+	+	−	−	−	−	−	+	+	+
Nasal	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	−	−	−
Strident	−	−	−	−	−	−	+	+	−	−	+	+	+	+	+	+	−	−	−	−	−	−

Table 1 (continued)

Feature / IPA	w	j	i	ɪ	eɪ	ɛ	æ	ə	ʌ	u	ʊ	oʊ	ɔ	ɑ
Vocalic	−	−	+	+	+	+	+	+	+	+	+	+	+	+
Consonantal	−	−	−	−	−	−	−	−	−	−	−	−	−	−
High	+	+	+	+	−	−	−	−	−	+	+	−	−	−
Back	+	−	−	−	−	−	−	−	−	+	+	+	+	+
Low	−	−	−	−	−	−	+	−	+	−	−	−	−	+
Anterior	−	−	−	−	−	−	−	−	−	−	−	−	−	−
Coronal	−	−	−	−	−	−	−	−	−	−	−	−	−	−
Round	+	−	−	−	−	−	−	−	−	+	+	+	+	−
Tense	−	−	+	−	+	−	−	−	−	+	−	+	−	−
Voiced														
Continuant														
Nasal														
Strident														

"lateral/nonlateral," "instantaneous release/delayed release," and "sonorant/nonsonorant."

The orthographic characters chosen to represent each phoneme were those used in Webster's New Collegiate Dictionary (1975), rather than the symbols of the International Phonetic Alphabet, which would have been unfamiliar to the subjects. The first of the two key words accompanying each phoneme contained the sound in the initial position, except for /ʒ/ and /ŋ/, which do not occur initially in English. The second key word contained the sound in either the medial or final position.

In order to minimize the confounding effect of the key words' connotation on subject responses to the sounds they illustrated, the words themselves were chosen from a semantic profile atlas (Heise, 1965). This "dictionary of affective content" lists the 1,000 most frequently used words in English and supplies semantic differential scores for each on the evaluative, potency, and activity dimensions of connotative meaning.

From these scores an index of each word's "polarization" is derived. "Polarization" is an expression of the word's distance from neutrality in the semantic space defined by evaluative, potency, and activity scores. It is derived by calculating the root mean square of those scores. Accordingly, the nearer a word's polarization index approximates zero, the closer that word's connotative meaning approaches neutrality.

Table 2 provides a correspondence of IPA symbols to the Webster symbols used in the testing instrument. It also lists the lexical items chosen from Heise's atlas to represent each phoneme as "key words" and indicates their polarization indexes. Within the confines of initial and medial/final placement of each sound within the key words, the lexical items chosen were those with polarization indexes closest to zero.

The semantic differential scales on which subjects were asked to rate each sound were selected from Miron (1961). In his study on cross-language (Japanese-American) phonetic symbolism, which utilized 16 pairs of bipolar adjectives, factor analyses confirmed in this context the suitability of the scales in measuring the three dimensions of connotative meaning. Separate analyses were performed for the Japanese and American groups of subjects.

From the analysis of the American group of subjects, nine of the 16 scales were chosen for the present study. They were the three scales in each dimension (evaluative, potency, and activity) which showed the highest factor loadings, as outlined in Table 3.

Shriberg (1970) utilized 12 of Miron's scales in a study of phonetic symbolism in voiceless fricatives. Order of presentation was not randomized for scales, sounds, or dimensions. Analyses of variance revealed highly significant ($p < .001$) main effects and interaction effects for Sound X Dimension and Sound X Scale. In order to minimize such

Table 2

Phonetic Symbols and Key Words
Used in Testing Instrument

Webster	IPA	Key Word and Polarization Index
p	p	part (0.43), up (0.80)
b	b	body (0.89), neighbor (0.45)
t	t	tell (0.45), event (0.53)
d	d	direction (0.71), regard (0.76)
k	k	keep (0.50), lake (0.84)
g	g	get (0.43), agree (0.98)
f	f	fill (0.16), effect (0.59)
v	v	very (0.40), prove (0.88)
th	θ	think (0.75), both (0.50)
<u>th</u>	ð	then (0.40), other (0.63)
s	s	send (0.29), purpose (0.71)
z	z	choose (0.69), result (0.50)
sh	ʃ	shoulder (0.74), national (0.70)
zh	ʒ	decision (0.63), usually (1.04)
ch	tʃ	change (0.53), rich (0.31)
j	dʒ	just (0.91), change (0.66)
m	m	main (0.37), time (0.64)
n	n	nest (0.30), line (0.48)
ŋ	ŋ	morning (0.59), long (0.95)
l	l	leave (0.38), tell (0.45)
r	r	reason (0.60), wear (0.68)
h	h	hold (0.47), hear (0.59)
w	w	want (0.47), always (1.02)

Table 2 (continued)

Webster	IPA	Key Word and Polarization Index
y	j	year (0.40), yes (1.01)
ē	i	eat (0.93), see (0.42)
i	ɩ	influence (0.69), spirit (0.45)
ā	eɩ	day (0.59), name (0.65)
e	ɛ	everything (0.21), ready (0.73)
a	æ	act (0.47), class (0.29)
ə	ə	across (0.57), moment (0.79)
'ə	ʌ	up (0.80), husband (0.49)
ü	u	soon (0.67), d0 (0.84)
u̇	ʊ	look (0.67), put (0.38)
ō	oʊ	over (0.60), so (0.64)
ȯ	ɔ	already (0.74), office (0.57)
a	ɑ	article (0.68), follow (0.70)

Table 3

Semantic Differential Scales Used
in Testing Instrument

Scale	Factor Loading	Dimension
1. Good-Bad	.82	
2. Beautiful-Ugly	.84	Evaluative
3. Pleasant-Unpleasant	.89	
4. Strong-Weak	.93	
5. Powerful-Powerless	.90	Potency
6. Large-Small	.87	
7. Colorful-Colorless	.45	
8. High-Low	.75	Activity
9. Hard-Soft	.49	

effects, which Shriberg attributed to order and fatigue, an effort was made in the present study to randomize these elements in the testing instrument.

The scales themselves were arranged in four orders. Order of presentation of the phonemes was likewise divided into four sequences. In assembling the individual sheets of the testing instrument, the phonemes of each order were individually paired with the sequence of scales in the corresponding scale order.

The sheets for each phoneme, thus arranged, were then collated and shuffled to further randomize order in the final booklet presented to subjects.

The test booklets were scored in the usual manner, assigning to each scale a value ranging from 1 to 7. Lower scale values reflected subject responses nearer the negative end of the scales. The data from the testing instruments were then transferred to IBM code sheets, maintaining separate categories for scale responses in each of the three dimensions -- evaluative, potency, and activity.

CHAPTER III

Results and Discussion

Computer Processing

From the raw data, means were calculated for each of the semantic dimensions (Evaluation, Potency, and Activity) for all 36 sounds across all 99 subjects. Overall Pearson product-moment correlation coefficients were also calculated to show the intercorrelations between these means.

A similar procedure was followed for the 26 Chomsky-Halle distinctive features, each of which had been defined for this purpose as consisting of a unique grouping of sounds. Accordingly, means for each of the semantic dimensions were calculated for each feature across all subjects. Intercorrelations were calculated for all features across each dimension. Analyses of variance for differences among the Chomsky-Halle features were then performed for each semantic dimension. A modified split-plot design was utilized.

The final statistical procedure employed was Duncan's Multiple Range Test, which provided, for each dimension, a ranking of the distinctive features by mean score. This test also provided an indication of which feature means differed significantly from the others within each semantic dimension.

Results

The semantic differential scales on which subjects rated each sound were seen to reflect the reasonably independent nature of Evaluation, Potency, and Activity as dimensions of connotative meaning. Table 4 displays overall Pearson product-moment correlation coefficients for each dimension and indicates that the Evaluative aspect is a more discrete measure of the dependent variable of semantic effect than are the Potency and Activity factors. The Evaluative dimension correlates at a very low level with the other two dimensions, while the correlation between the Potency and Activity dimensions is much higher. This finding supports considerable prior research, notably that of Osgood, Suci, and Tannenbaum (1957) and of Miron (1961), from whom the scales were chosen.

Tables 5-7 show the data of Table 4 broken down into the individual Chomsky-Halle features. They report, for the three dimensions, the individuals *r*'s for each Chomsky-Halle distinctive feature. In these tables, the features are identified by an alphabetic code, which is given below:

A	[+ vocalic]	N	[- coronal]
B	[- vocalic]	O	[+ round]
C	[+ consonantal]	P	[- round]
D	[- consonantal]	Q	[+ tense]
E	[+ high]	R	[- tense]
F	[- high]	S	[+ voiced]
G	[+ back]	T	[- voiced]
H	[- back]	U	[+ continuant]
I	[+ low]	V	[- continuant]
J	[- low]	W	[+ nasal]
K	[+ anterior]	X	[- nasal]
L	[- anterior]	Y	[+ strident]
M	[+ coronal]	Z	[- strident]

Table 4

Overall Correlations for Semantic Dimensions
Across Subjects and Sounds

	E	P	A
E	1.00	.11673**	.16474**
P		1.00	.56892**
			1.00

$^{**}p < .0001$

Table 5

Correlation Coefficients for Evaluative
Dimension Among Chomsky-Halle Features

	AE	BE	CE	DE	EE	FE	GE	HE	IE	JE	KE	LE	ME
AE	1.000	.640	.610	.953	.750	.811	.741	.807	.716	.816	.550	.775	.562
BE		1.000	.984	.661	.809	.929	.685	.941	.504	.950	.927	.843	.916
CE			1.000	.589	.777	.921	.643	.924	.434	.935	.934	.833	.948
DE				1.000	.806	.777	.807	.795	.758	.820	.542	.780	.503
EE					1.000	.738	.841	.805	.507	.888	.611	.941	.705
FE						1.000	.707	.957	.634	.948	.898	.803	.853
GE							1.000	.635	.564	.786	.550	.734	.506
HE								1.000	.612	.964	.878	.877	.881
IE									1.000	.532	.377	.556	.338
JE										1.000	.874	.903	.869
KE											1.000	.648	.870
LE												1.000	.803
ME													1.000

_r_ rounded to three significant digits

*$p > .05$ (n.s.)

Table 5 (continued)

	NE	OE	PE	QE	RE	SE	TE	UE	VE	WE	XE	YE	ZE
AE	.899	.701	.909	.600	.822	.616	.508	.598	.506	.471	.590	.485	.608
BE	.785	.557	.553	.371	.571	.927	.849	.800	.862	.581	.965	.813	.921
CE	.724	.502	.501	.352	.507	.916	.871	.879	.872	.549	.978	.839	.911
DE	.957	.776	.915	.567	.887	.623	.477	.555	.534	.510	.569	.479	.597
EE	.846	.755	.673	.481	.722	.719	.674	.627	.746	.455	.757	.755	.654
FE	.857	.571	.722	.439	.682	.895	.768	.841	.795	.591	.896	.687	.918
GE	.859	.876	.592	.460	.734	.653	.499	.462	.693	.579	.585	.510	.619
HE	.854	.522	.756	.465	.685	.875	.806	.878	.765	.537	.916	.777	.867
IE	.743	.352	.799	.090*	.814	.524	.329	.378	.481	.486	.424	.226	.566
JE	.891	.712	.704	.542	.689	.879	.804	.843	.807	.570	.910	.802	.853
KE	.680	.478	.440	.341	.448	.873	.801	.868	.770	.575	.903	.746	.883
LE	.811	.643	.702	.468	.690	.750	.752	.711	.759	.406	.832	.816	.689
ME	.574	.429	.434	.370	.399	.839	.848	.903	.735	.405	.946	.843	.821

r rounded to three significant digits

*$p > .05$ (n.s.)

Table 5 (continued)

	NE	OE	PE	QE	RE	SE	TE	UE	VE	WE	XE	YE	ZE
NE	1.000	.758	.857	.501	.866	.746	.588	.616	.709	.617	.689	.562	.734
OE		1.000	.478	.642	.608	.495	.406	.434	.457	.418	.463	.504	.411
PE			1.000	.398	.883	.546	.386	.467	.460	.438	.482	.359	.539
QE				1.000	.143*	.280	.382	.466	.153*	.128*	.372	.392	.273
RE					1.000	.580	.340	.377	.556	.530	.458	.367	.531
SE						1.000	.617	.799	.822	.630	.875	.680	.907
TE							1.000	.809	.726	.349	.892	.822	.745
UE								1.000	.546	.358	.909	.810	.779
VE									1.000	.643	.810	.633	.857
WE										1.000	.385	.246	.664
XE											1.000	.861	.874
YE												1.000	.554
ZE													1.000

_r_ rounded to three significant digits

*$p > .05$ (n.s.)

Table 6

Correlation Coefficients for Potency
Dimension Among Chomsky-Halle Features

	AP	BP	CP	DP	EP	FP	GP	HP	IP	JP	KP	LP	MP
AP	1.000	.287	.245	.915	.506	.660	.697	.587	.682	.566	.228	.587	.278
BP		1.000	.972	.343	.789	.831	.499	.887	.012*	.931	.888	.728	.886
CP			1.000	.227	.727	.825	.437	.852	-.083*	.905	.918	.678	.918
DE				1.000	.602	.610	.711	.628	.749	.588	.222	.634	.221
EP					1.000	.642	.681	.786	.164*	.869	.539	.893	.690
FP						1.000	.660	.886	.334	.901	.826	.654	.731
GP							1.000	.478	.364	.668	.377	.544	.315
HP								1.000	.322	.936	.803	.824	.828
IP									1.000	.134*	-.053*	.328	-.099*
JP										1.000	.833	.808	.845
KP											1.000	.447	.808
LP												1.000	.724
MP													1.000

_r_ rounded to three significant digits

*_p_ > .05 (n.s.)

Table 6 (continued)

	NP	OP	PP	QP	RP	SP	TP	UP	VP	WP	XP	YP	ZP
AP	.806	.710	.834	.463	.802	.181*	.298	.334	.131*	.172*	.250	.170*	.272
BP	.627	.369	.202	.408	.140*	.855	.733	.775	.816	.357	.947	.696	.882
CP	.536	.284	.119*	.401	.031*	.880	.714	.758	.843	.362	.953	.718	.878
DP	.899	.735	.902	.435	.886	.140*	.366	.352	.124*	.147*	.264	.199	.261
EP	.736	.582	.449	.561	.372	.600	.624	.648	.564	.226	.732	.651	.589
FP	.811	.527	.509	.451	.448	.725	.627	.630	.721	.331	.797	.485	.820
GP	.802	.864	.441	.497	.548	.432	.298	.275	.462	.352	.387	.169*	.514
HP	.785	.420	.576	.457	.443	.686	.763	.802	.630	.274	.861	.699	.738
IP	.607	.259	.820	-.087*	.847	-.060*	.074*	.096*	-.095*	.085	-.030*	-.074*	.042*
JP	.792	.598	.427	.591	.345	.756	.736	.755	.728	.337	.879	.676	.802
KP	.528	.277	.124*	.363	.052*	.803	.658	.686	.779	.394	.854	.576	.857
LP	.690	.485	.549	.454	.456	.532	.640	.687	.466	.130*	.719	.720	.490
MP	.393	.281	.117*	.433	.011*	.780	.691	.811	.666	.275	.891	.772	.730

_r_ rounded to three significant digits

*$p > .05$ (n.s.)

Table 6 (continued)

	NP	OP	PP	QP	RP	SP	TP	UP	VP	WP	XP	YP	ZP
NP	1.000	.694	.783	.455	.757	.442	.526	.475	.437	.239	.262	.271	.574
OP		1.000	.361	.514	.537	.239	.262	.271	.223	.231	.256	.167*	.304
PP			1.000	.267	.878	.024*	.293	.254	.028*	.037*	.169*	.157*	.126*
QP				1.000	-.009*	.288	.361	.341	.293	.049*	.404	.368	.290
RP					1.000	-.009*	.182*	.166*	-.017*	.126*	.056*	.018*	.107*
SP						1.000	.316	.564	.835	.542	.770	.498	.858
TP							1.000	.757	.453	-.028*	.802	.702	.547
UP								1.000	.307	.137*	.805	.827	.533
VP									1.000	.448	.749	.350	.892
WP										1.000	.094*	-.007*	.506
XP											1.000	.768	.801
YP												1.000	.318
ZP													1.000

r rounded to three significant digits

*$p > .05$ (n.s.)

Table 7

Correlation Coefficients for Activity
Dimension Among Chomsky-Halle Features

	AA	BA	CA	DA	EA	FA	GA	HA	IA	JA	KA	LA	MA
AA	1.000	.389	.336	.910	.511	.699	.715	.649	.629	.664	.340	.565	.312
BA		1.000	.962	.340	.694	.837	.519	.905	.281	.911	.875	.719	.840
CA			1.000	.254	.637	.832	.451	.860	.140*	.886	.892	.690	.892
DA				1.000	.574	.594	.742	.632	.733	.630	.292	.548	.186*
EA					1.000	.488	.703	.667	.258	.784	.411	.852	.563
FA						1.000	.601	.899	.459	.887	.845	.594	.712
GA							1.000	.494	.492	.682	.369	.581	.303
HA								1.000	.446	.936	.831	.750	.782
IA									1.000	.291	.149*	.374	.060*
JA										1.000	.826	.773	.783
KA											1.000	.406	.744
LA												1.000	.733
MA													1.000

r rounded to three significant digits

$*p > .05$ (n.s.)

Table 7 (continued)

	NA	OA	PA	QA	RA	SA	TA	UA	VA	WA	XA	YA	ZA
AA	.824	.652	.863	.348	.816	.426	.180*	.309	.284	.387	.292	.085*	.446
BA	.672	.240	.365	.123*	.340	.870	.792	.791	.779	.413	.946	.684	.881
CA	.561	.142*	.268	.161*	.196	.882	.788	.748	.827	.365	.964	.733	.856
DA	.897	.710	.891	.286	.898	.347	.198	.320	.209	.428	.236	.060*	.406
EA	.682	.479	.498	.390	.423	.632	.457	.458	.580	.313	.616	.563	.513
FA	.784	.345	.609	.181*	.552	.782	.638	.645	.701	.427	.796	.432	.859
GA	.803	.785	.427	.387	.599	.526	.272	.263	.506	.471	.391	.142*	.562
HA	.795	.297	.660	.178*	.570	.792	.713	.775	.649	.424	.842	.622	.797
IA	.662	.292	.713	.232*	.820	.240	.168*	.246	.146*	.372	.159*	-.059*	.369
JA	.817	.485	.576	.376	.494	.828	.680	.706	.723	.447	.842	.615	.809
KA	.583	.183*	.288	.161*	.232	.770	.736	.730	.689	.439	.836	.579	.822
LA	.605	.375	.517	.238	.465	.677	.510	.556	.574	.224	.702	.654	.529
MA	.342	.140*	.188*	.161*	.133*	.754	.722	.755	.637	.132*	.903	.753	.684

r rounded to three significant digits

*p > .05 (n.s.)

Table 7 (continued)

	NA	OA	PA	QA	RA	SA	TA	UA	VA	WA	XA	YA	ZA
NA	1.000	.597	.823	.270	.797	.611	.427	.466	.525	.585	.507	.251	.676
OA		1.000	.361	.514	.509	.215	.065*	.189	.090*	.310	.101	.023	.220
PA			1.000	.168*	.872	.346	.172*	.252	.251	.352	.241	.084*	.371
QA				1.000	-.132*	.190*	-.008*	-.030*	.215	.105*	.099*	.111*	.088*
RA					1.000	.278	.170*	.306	.129*	.373	.187*	.019	.353
SA						1.000	.440	.602	.799	.559	.794	.563	.821
TA							1.000	.754	.551	.082*	.856	.654	.673
UA								1.000	.275	.170*	.804	.742	.582
VA									1.000	.470	.741	.401	.831
WA										1.000	.158*	.058*	.511
XA											1.000	.752	.816
YA												1.000	.307
ZA													1.000

$\underline{r}$ rounded to three significant digits

$^*\underline{p} > .05$ (n.s.)

As expected, the Evaluative dimension (Table 5) demonstrated the greatest consistency of response across subjects. For this factor, only the feature Q, [+ tense], evidenced an appreciable number of nonsignificant correlations. The range of *r* for the Evaluative dimension was

On the Potency dimension (Table 6), the factors I, [+ low], and R, [- tense], show the largest numbers of nonsignificant *r*'s. It is apparent from this table that the variance in the subjects' ratings of sounds containing the features [+ low] or [- tense] differs from the variance in their ratings of the other features on this dimension.

Subjects responded with much less consistency to Potency as an aspect of connotative meaning than they did to the Evaluative factor. Again, this finding substantiates prior research in semantic differentiation and is implied by the correlation coefficients shown in Table 4. The range of *r* for Potency was

A similar pattern of responses is manifest for the Activity dimension (Table 7). There was considerably more diversity of response to Activity as an affective element than there was to the Evaluative factor. Although this is not an unexpected finding, it is of interest to note that the feature Q, [+ tense], evidenced by far the greatest number of nonsignificant correlations, as it did for the Evaluative dimension. The range of *r* for Activity was

A further question of interest is whether the Chomsky-Halle distinctive feature system itself produced different semantic responses among subjects for the sounds under consideration. Analyses of variance for differences among all Chomsky-Halle features across subjects for each dimension are displayed in Tables 8-10. In each, a highly significant value of $\underline{F}$ ($\underline{p} < .0001$) showed that the subjects did respond differently to the various features.

This finding establishes the validity of some features in the Chomsky-Halle system as discriminating among subject responses on the Evaluation, Potency, and Activity dimensions of connotative meaning. To determine which mean feature differences were significant in this regard, the data on which the analyses of variance were performed were utilized in Duncan's Multiple Range Test.

The results of this test are shown in Tables 11-13. Within each dimension, means for each feature across subjects are ranked from highest semantic differential ratings to lowest. A higher value indicates subject responses nearer the greater extreme of each dimension, *e.g.*, more Potent. Additionally, the means are grouped in a fashion similar to that in factor analysis. Means and corresponding features with the same grouping number are not significantly different in accounting for variation within each affective dimension.

In examining Duncan's Test for the Evaluative dimension (Table 11) the feature Q, [+ tense], emerges as the feature

Table 8

ANOVA For Differences Among All Chomsky-Halle Features on Evaluative Dimension

Source	df	Sum of Squares	Mean Square	F
Subjects	98	578.34596557	5.9014893	43.46**
Features	25	276.34309883	11.053723	81.41**
Error	2450	332.62210542	0.13578045	

$^{**}p < .0001$

Table 9

ANOVA For Differences Among All Chomsky-Halle Features on Potency Dimension

Source	df	Sum of Squares	Mean Square	F
Subjects	98	358.07440831	3.6538204	20.15**
Features	25	316.96550223	12.67862	69.92**
Error	2450	444.26508973	0.18133269	

$^{**}p < .0001$

Table 10

ANOVA For Differences Among All Chomsky-Halle Features on Activity Dimension

Source	*df*	Sum of Squares	Mean Square	*F*
Subjects	98	220.55217330	2.2505323	20.68**
Features	25	252.02817741	10.081126	92.63**
Error	2450	266.62627122	0.10882705	

$^{**}p < .0001$

Table 11

Duncan's Multiple Range Test for Evaluative Dimension

Grouping					Mean	ID	Feature
		1			4.882155	Q	[+ tense]
		2			4.483446	F	[- high]
		2			4.473251	T	[- voiced]
3		2			4.422980	Y	[+ strident]
3		2	4		4.419345	U	[+ continuant]
3	5	2	4		4.384615	M	[+ coronal]
3	5	6	4		4.348822	O	[+ round]
3	5	6	4		4.348565	C	[+ consonantal]
3	5	6	4		4.344498	X	[- nasal]
3	5	6	4		4.340067	W	[+ nasal]
3	5	6	4		4.337016	J	[- low]
3	5	6	4		4.334315	B	[- vocalic]
3	5	6	4		4.319616	H	[- back]
	5	6	4		4.298701	Z	[- strident]
7	5	6			4.282828	E	[+ high]
7	5	6			4.281866	A	[+ vocalic]
7	5	6			4.268442	V	[- continuant]
7		6			4.254338	S	[+ voiced]
7		6			4.251208	N	[- coronal]
7		6			4.238683	G	[+ back]
7		6			4.230527	D	[- consonantal]

Table 11 (continued)

Grouping					Mean	ID	Feature
7					4.163113	P	[- round]
		8			2.998316	I	[+ low]
		8			3.968350	R	[- tense]
		9			2.839994	L	[- anterior]

Table 12

Duncan's Multiple Range Test for Potency Dimension

Grouping					Mean	ID	Feature
			1		4.750000	Q	[+ tense]
			2		4.613101	V	[- continuant]
	3		2		4.498457	F	[- high]
	3		4		4.468790	S	[+ voiced]
	3		4	5	4.425525	C	[+ consonantal]
	3		4	5	4.419635	X	[- nasal]
	3	6	4	5	4.402838	Z	[- strident]
7	3	6	4	5	4.387205	M	[+ coronal]
7	3	6	4	5	4.368827	B	[- vocalic]
7	3	6	4	5	4.359492	K	[+ anterior]
7		6	4	5	4.357744	Y	[- strident]
7	8	6	4	5	4.340326	E	[+ high]
7	8	6	4	5	4.328072	J	[- low]
7	8	6		5	4.317621	G	[+ back]
7	8	6	9		4.267490	T	[- voiced]
7	8		9	10	4.259509	H	[- back]
7	8		9	10	4.251178	O	[+ round]
	8		9	10	4.210072	N	[- coronal]
	11		9	10	4.176207	W	[+ nasal]
	11		9	10	4.159780	U	[+ continuant]
	11		12	10	4.126263	A	[+ vocalic]

Table 12 (continued)

Grouping					Mean	ID	Feature
	11		12		4.061963	D	[- consonantal]
			12		4.011972	P	[- round]
			13		3.841751	I	[+ low]
			13		3.836364	R	[- tense]
			14		2.801090	L	[- anterior]

Table 13

Duncn's Multiple Range Test for Activity Dimension

Grouping					Mean	ID	Feature
	1				4.515993	Q	[+ tense]
	2				4.292317	V	[- continuant]
3	2				4.255612	F	[- high]
3	4				4.178710	E	[+ high]
3	4				4.169386	M	[+ coronal]
3	4				4.169192	Y	[+ strident]
3	4				4.165338	X	[- nasal]
5	4				4.139490	C	[+ consonantal]
5	4				4.136177	T	[- voiced]
5	4	6			4.116349	P	[- round]
5	4	6			4.109848	J	[- low]
5	4	6			4.106967	S	[+ voiced]
5	4	6			4.106746	H	[- back]
5	4	6			4.095679	B	[- vocalic]
5	4	6			4.090188	Z	[- strident]
5	4	6			4.072150	A	[+ vocalic]
5	7	6			4.041440	K	[+ anterior]
5	7	6			4.036305	N	[- coronal]
	7	6			4.017209	G	[+ back]
	7	6			4.007183	D	[- consonantal]
8	7				3.945516	U	[+ continuant]

Table 13 (continued)

8	9				3.880471	I	[+ low]
8	9				3.874747	O	[+ round]
	9				3.835690	R	[- tense]
	9				3.824916	W	[+ nasal]
	10				2.645151	L	[- anterior]

most highly rated. Since it shares a grouping number with no other feature, the conclusion may be drawn that it is more closely allied with high Evaluative ratings than is any other feature. Sounds which contain this feature are more likely to be rated more "Good," more "Beautiful," and more "Pleasant" than sounds in which it is absent. (Cf. Table 3.)

Conversely, sounds which share the feature L, [- anterior], are more likely to receive lower Evaluative ratings. The two features are significantly different from all others in accounting for variation in Evaluative responses.

Though they are not significantly different between themselves, it is interesting to note that the features I, [+ low], and R, [- tense], cluster at the lower end of the Evaluative rankings and are jointly significant in producing such responses.

In comparing these findings with the correlations in Table 5, feature Q, [+ tense], shows the greatest number of nonsignificant r's, indicating that this feature also produced the greatest variance in responses across subjects and sounds.

A similar observation for feature L, [- anterior], is not borne out in Table 5, where responses were significantly correlated. Features I and R each show only one nonsignificant r in that table.

On Duncan's Test for the Potency dimension (Table 12), feature Q, [+ tense], is again most significant in accounting for higher ratings, *i.e.*, subject responses which may be described as more "Strong," more "Powerful," and more "Large." Also again, feature L, [- anterior], is most likely to account for lower ratings; and features I, [+ low], and R, [- tense], are clustered toward that extremity.

A comparison with the correlations in Table 6 reveals the highest number of nonsignificant *r*'s occurring with features I, [+ low], and R, [- tense]. However, feature Q, [+ tense], shows only a small distribution of nonsignificant correlations; feature L, [- anterior], is again significantly correlated, as on the Evaluative dimension.

Table 13 displays the results of Duncan's Test for the Activity component of connotative meaning. Once again feature Q, [+ tense], shows the highest mean and is isolated as the feature most predictive of "Colorful," "High," and "Hard" subject responses. Its counterpart for responses most indicative of low Activity ratings is again feature L, [- anterior]. Features I, [+ low], and R, [- tense], are less distinct than on the Evaluative and Potency dimensions but appear in comparable positions.

The predominance of nonsignificant *r*'s for feature Q, [+ tense], in Table 7 indicates that responses for this feature encompass greater variation than responses for any other feature on the Activity dimension. Feature L, [- anterior], manifests consistently significant correlations. The number of nonsignificant *r*'s for feature I, [+ low], and R,

[- tense], is appreciable but less striking than on the Potency dimension.

Discussion

The results of Duncan's Test for the Evaluation, Potency, and Activity dimensions show feature Q, [+ tense], to be significantly different from all other features in predicting higher ratings on each of the dimensions of affective meaning. An interesting phenomenon becomes evident, however, upon examination of the individual sounds which share the feature Q, [+ tense], *i.e.*, /i/, /eɪ/, /u/, and /oʊ/. (See Appendix for a listing of sounds by feature.)

These four vowels appear also in the group of sounds which share the feature L, [- anterior]. (See Table 14.) As noted earlier, the feature L, [- anterior], is the feature most significantly responsible for *lower* subject ratings on each of the three semantic dimensions. However, the feature Q, [+ tense], consistently and significantly predicts higher ratings on all dimensions, despite the fact that the sounds in that category also share the feature L, [- anterior], which was seen to discriminate lower ratings in a similar fashion. The implication of this finding is that for the vowels /i/, /eɪ/, /u/, and /oʊ/, at least, the feature Q, [+ tense], is more salient than the feature L, [- anterior], in accounting for higher Evaluative, Potency, and Activity ratings.

Table 14

Selected Chomsky-Halle Features Indicating Sounds in Common

Feature L [- anterior]	Feature Q [+ tense]	Feature I [+ low]	Feature R [- tense]
/k/			
/g/			
/ʃ/			
/ʒ/			
/tʃ/			
/dʒ/			
/ŋ/			
/r/			
/h/		/h/	
/w/			/w/
/j/			/j/
/i*/	/i*/		
/ɪ/			/ɪ/
/eɪ*/	/eɪ*/		
/ɛ/			/ɛ/
/æ*/		/æ*/	/æ*/
/ə/			/ə/
/ʌ/		/ʌ/	/ʌ/
/u*/	/u*/		
/ʊ/			/ʊ/
/oʊ*/	/oʊ*/		

Table 14 (continued)

Feature L [- anterior]	Feature Q [+ tense]	Feature I [+ low]	Feature R [- tense]
/ɔ/			/ɔ/
/ɑ*/		/ɑ*/	/ɑ*/

To a lesser extent, Table 14 also reflects overlap between features L and R, and between L and I. Feature I shares three of its four sounds with L; feature R shows three of ten in common with L. The common sounds among these three features are /æ/, /ʌ/, and /ɑ/, as indicated in the table.

In these cases, however, the three features are clustered among the lowest Evaluative, Potency, and Activity ratings (Tables 11-13). Thus, the overlap is not as striking as that of feature Q, [+ tense], with L, [- anterior]. Indeed, the occurrence of common sounds among features I, R, and L may contribute to what are essentially similar responses to these features.

The interdependent nature of features Q, I, R, and L, particularly the overlap of sounds between Q, [+ tense], and L, [- anterior], is a finding of some importance in the area of phonetic symbolism. Comparisons with prior research are tenuous because of the widely divergent methodologies involved. However, studies which have focused systematically on the phoneme as a mediator of the phenomenon of phonetic symbolism may have concentrated on a unit of sound sufficiently multifaceted to have a confounding effect on their results.

That phonetic symbolism does exist is strongly suggested in the present study by the regularity and significance with which certain of the Chomsky-Halle features are predictive of semantic distinctions. It is also evident that the intrinsic nature of phonetic symbolism is to be found at a level more elemental than that of the individual sound.

It is hoped that the findings presented here will encourage further investigation of phonetic symbolism at the distinctive feature level. The utilization of methodologies in distinctive feature analysis beyond the scope of this study would appear to hold promise for a more precise isolation of the essence of phonetic symbolism than has been the case historically.

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APPENDIX

[+ vocalic]	[- vocalic]	[+ consonantal]	[- consonantal]
/ l /	/ p /	/ p /	/ h /
/ r /	/ b /	/ b /	/ w /
/ i /	/ t /	/ t /	/ j /
/ ɩ /	/ d /	/ d /	/ i /
/ eɩ /	/ k /	/ k /	/ ɩ /
/ ɛ /	/ g /	/ g /	/ eɩ /
/ æ /	/ f /	/ f /	/ ɛ /
/ ə /	/ v /	/ v /	/ æ /
/ ʌ /	/ θ /	/ θ /	/ ə /
/ u /	/ ð /	/ ð /	/ ʌ /
/ ω /	/ s /	/ s /	/ u /
/ oω /	/ z /	/ z /	/ ω /
/ ɔ /	/ ʃ /	/ ʃ /	/ oω /
/ ɑ /	/ ʒ /	/ ʒ /	/ ɔ /
	/ tʃ /	/ tʃ /	/ ɑ /
	/ dʒ /	/ dʒ /	
	/ m /	/ m /	
	/ n /	/ n /	
	/ ŋ /	/ ŋ /	
	/ h /	/ l /	
	/ w /	/ r /	
	/ j /		

[- high]

/ p /
/ b /
/ t /
/ d /
/ f /
/ v /
/ θ /
/ ð /
/ s /
/ z /
/ m /
/ m /
/ l /
/ r /
/ h /
/ eɪ /
/ ɛ /
/ æ /
/ ə /
/ ʌ /
/ oʊ /
/ ɔ /
/ ɑ /

[+ high]

/ k /
/ g /
/ ʃ /
/ ʒ /
/ tʃ /
/ dʒ /
/ w /
/ j /
/ i /
/ ɪ /
/ u /
/ ʊ /

[+ back]

/ k /
/ g /
/ ŋ /
/ w /
/ u /
/ ʊ /
/ oʊ /
/ ɔ /
/ ɑ /

[- back]

/ p /
/ b /
/ t /
/ d /
/ f /
/ v /
/ θ /
/ ð /
/ s /
/ z /
/ ʃ /
/ ʒ /
/ tʃ /
/ dʒ /

[- back] Cont.

/ m /
/ n /
/ l /
/ r /
/ h /
/ j /
/ i /
/ ɪ /
/ eɪ /
/ ɛ /
/ æ /
/ ə /
/ ʌ /

[+ low]

/ h /
/ æ /
/ ʌ /
/ ɑ /

[- low]

/ p /
/ b /
/ t /
/ d /
/ k /
/ g /
/ f /
/ v /
/ θ /
/ ð /
/ s /
/ z /
/ ʃ /
/ ʒ /
/ tʃ /
/ dʒ /
/ m /
/ n /
/ ŋ /

[- low] Cont.

/ l /
/ r /
/ w /
/ j /
/ i /
/ ɪ /
/ eɪ /
/ ɛ /
/ ə /
/ u /
/ ʊ /
/ oʊ /
/ ɔ /

[+ anterior]

/ p /
/ b /
/ t /
/ d /
/ f /
/ v /
/ θ /
/ ð /
/ s /
/ z /
/ m /
/ n /
/ l /

[- anterior]

/ k /
/ g /
/ ʃ /
/ ʒ /
/ tʃ /
/ dʒ /
/ ŋ /
/ r /
/ h /
/ w /
/ j /
/ i /
/ ɪ /
/ eɪ /
/ ɛ /
/ æ /
/ ə /
/ ʌ /
/ u /
/ ʊ /
/ oʊ /
/ ɔ /
/ ɑ /

[+ coronal]	[- coronal]	[+ round]	[- round]
/ t /	/ p /	/ w /	/ j /
/ d /	/ b /	/ u /	/ i /
/ θ /	/ k /	/ ω /	/ ι /
/ ð /	/ g /	/ oω /	/ eι /
/ s /	/ f /	/ ɔ /	/ ɛ /
/ z /	/ v /		/ æ /
/ ʃ /	/ m /		/ ə /
/ ʒ /	/ ŋ /		/ ʌ /
/ tʃ /	/ h /		/ ɑ /
/ dʒ /	/ w /		
/ h /	/ j /		
/ l /	/ i /		
/ r /	/ ι /		
	/ eι /		
	/ ɛ /		
	/ æ /		
	/ ə /		
	/ ʌ /		
	/ u /		
	/ ω /		
	/ oω /		
	/ ɔ /		
	/ ɑ /		

[+ tense]	[- tense]	[+ voiced]	[- voiced]
/ i /	/ w /	/ b /	/ p /
/ eɪ /	/ j /	/ d /	/ t /
/ u /	/ ɪ /	/ g /	/ k /
/ oʊ /	/ ɛ /	/ v /	/ f /
	/ æ /	/ ð /	/ θ /
	/ ə /	/ z /	/ s /
	/ ʌ /	/ ʒ /	/ ʃ /
	/ ʊ /	/ dʒ /	/ tʃ /
	/ ɔ /	/ m /	/ h /
	/ ɑ /	/ n /	
		/ ŋ /	
		/ l /	
		/ r /	

[+ continuant]	[- continuant]	[+ nasal]	[- nasal]
/ f /	/ p /	/ m /	/ p /
/ v /	/ b /	/ n /	/ b /
/ θ /	/ t /	/ ŋ /	/ t /
/ ð /	/ d /		/ d /
/ s /	/ k /		/ k /
/ z /	/ g /		/ g /
/ ʃ /	/ tʃ /		/ f /
/ ʒ /	/ dʒ /		/ v /
/ l /	/ m /		/ θ /
/ r /	/ n /		/ ð /
/ h /	/ ŋ /		/ s /
			/ z /
			/ ʃ /
			/ ʒ /
			/ tʃ /
			/ dʒ /
			/ l /
			/ r /
			/ h /

[+ strident]	[- strident]
/ f /	/ p /
/ v /	/ b /
/ s /	/ t /
/ z /	/ d /
/ ʃ /	/ k /
/ ʒ /	/ g /
/ tʃ /	/ θ /
/ dʒ /	/ ð /
	/ m /
	/ n /
	/ ŋ /
	/ l /
	/ r /
	/ h /

VITA

Jay Allen Williams was born in Chattanooga, Tennessee, on July 22, 1943, the son of Donald and Mary Frances Williams. He completed a college preparatory curriculum at The Baylor School for Boys in 1961. He attended the University of North Carolina in Chapel Hill and received the Bachelor of Arts degree from the University of Tennessee at Chattanooga in 1966. The Master of Arts degree was conferred by the University of Tennessee at Knoxville in 1968. He is presently engaged in educational administration in Los Angeles, California, and is a candidate for the Doctor of Philosophy degree in speech at Louisiana State University.

EXAMINATION AND THESIS REPORT

Candidate: Jay Allen Williams

Major Field: Speech

Title of Thesis: An Investigation of Phonetic Symbolism Utilizing the Chomsky-Halle System of Distinctive Features

Approved:

J. Donald Ragsdale
Major Professor and Chairman

Carolyn H. Hargrove
Dean of the Graduate School

EXAMINING COMMITTEE:

Thomas A. Fields

[illegible]

[illegible]

William W. Evans

Date of Examination:

July 20, 1978